



GENERAL MICROWAVE CORPORATION

155 MARINE STREET • FARMINGDALE, L.I., NEW YORK 11735

set # 112524

meter # 102274

Probe # 112878

SSF



RAHAM™

Model 2

**BROADBAND
ELECTROMAGNETIC RADIATION
HAZARD METER**

INSTRUCTION MANUAL

WARNING

Possible harmful effects result from exposure to electromagnetic radiation in the frequency range from 10 MHz to 100 GHz. The CW radiation protection guide is 10 mW/cm^2 . For modulated fields the power density of 10 mW/cm^2 as averaged over any six minute period should not be exceeded. These formulated recommendations by the American National Standards Institute (ANSI document C95.1-1974) pertain to both whole body irradiation and partial body irradiation.

General Microwave RAHAM* meets requirements specified for test equipment in the "IMPI Performance Standard on Leakage from Industrial Microwave Systems dated August 1973 (International Microwave Power Institute)".

* Patent applied for

7/77

© Copyright 1977 General Microwave Corporation

GENERAL MICROWAVE CORPORATION
Model 2 RAHAM Instruction Manual

ERRATA AND CHANGES

<u>SECTION</u>	<u>Item</u>	<u>Should Appear</u>
SPECIFICATIONS	Power Overload	1.0 W/cm ² average (at 25°C)
"	Response Time	1.5 seconds (approximate)
"	Approx. Weight	3-1/4 lb. (1,46 kg)
OPERATING PROCEDURE	(2) Select meter range...	Include Note: When measuring rf fields on the 200 mW/ cm ² range it is necessary to compensate for large signal effects. Add 0.1% per mW/cm ² to the reading.
THEORY OF OPERATION	Figure 4, first note	all resistors 0.5% (except 1% for R2), 1/4 watt.
CALIBRATION PROCEDURES	Page 16, sentence 4	...2870 ohms + 0.5%
"	Page 17, sentence 4	...39.90 mV
REPLACEMENT PARTS, TABLE 2	C1,C2	CAP, FXD, EPOXY DIPPED TANTALUM, 3.3 uF, 25V; P/N D1T3R3C25
"	FL1-FL7	FILTER, EMI/RF1; P/N 3223-000. MFRS CODE 16546
"	R18	RES, FXD, COMP, 51K + 5% P/N RC07GF683J
"	S1	MFRS CODE 11332 GMC P/N 7373-3
"	S2	SWITCH, PUSHBUTTON; P/N MSP-205R
"	S3	SWITCH, SLIDE MFRS CODE 11332 GMC P/N 8078-3

2/12/79

TABLE OF CONTENTS

Section	Page
Introduction	1
Specifications	2
General Information	3
Safety Precautions	4
Operating Controls	5
Operating Procedure	5
Theory of Operation	8
Maintenance	12
Battery Replacement	12
Troubleshooting	12
Repair	13
Replacement of Probe Protective Film	14
Calibration Procedures	16
Power Density Meter Calibration	16
Probe Calibration	17
Replacement Parts	18

List of Illustrations

Figure 1	RAHAM Probe	8
Figure 2	Schematic, RAHAM Power Meter	10
Figure 3	Replacing Protective Foam	14
Figure 4	Test Jig Schematic and Calibration Setup	11



Digitized by the Internet Archive
in 2025

INTRODUCTION

The RAHAMTM* Model 2 is a portable, battery-operated meter which detects and measures potentially hazardous electromagnetic radiation from rf and microwave sources. It is ideally suited for use with:

- Communications Systems
- Radar Systems
- Microwave Ovens
- Medical Equipment
- Electronic Warfare Systems
- Heaters and Dryers

The Model 2 RAHAM consists of a Model 481B Power Density Meter, Model 82 Probe, recorder input plug, extension cable and carrying case. Electrical, mechanical and performance characteristics of this model are described in table 1. The Model 82 probe is factory calibrated to permit field interchangeability with all Model 481B Power Density Meters.

*Radiation Hazard Meter

SPECIFICATIONS

FEATURE	DESCRIPTIVE DATA
Frequency Range	0.01 to 3.0 GHz
Power Density Ranges	Three 10 dB ranges with full scale readings of 2 mW/cm ² ; 20 mW/cm ² ; and 200 mW/cm ²
Frequency Sensitivity	±1.0 dB
Overall Measurement Accuracy at Calibration Frequency (2450 MHz)	±1.0 dB
Power Overload	1.0 W/cm ² average
Peak Power Density	30 W/cm ² (max.)
Pulse Energy Density	150 W/cm ² - usec (max.)
Polarization	Elliptical, measures linear and circularly polarized signals
Noise	Less than 1% peak-to-peak on most sensitive range
Response Time	1.5 seconds
Battery Operation	500 hours expendable
Recorder Output	0.124 volts full scale into a nominal resistance of 100K ohms
Operating Tem- perature Range	0°C to +55°C
Size	
Power Density Meter	2-1/2" x 1-5/8" x 6-3/8" (64 x 41 x 162 mm)
Probe	12-3/4" long x 1-1/2" max. dia. (324 x 38 mm)
Cable Assy	4' long (1, 22 m)
Carrying Case	13-1/2" x 10" x 4-1/16" (343 x 254 x 103 mm)
Approx. Weight	3-1/4 lbs. (92, 1 gm)

OPERATIONS

General Information

The user has the option of mounting the probe directly on the power density meter or interconnecting them with the extension cable. Whereas the directly connected probe offers convenient one-hand operation, the extended probe allows greater flexibility in probing for radiation fields in awkward or cramped areas, as well as permitting the operator to shield himself from potentially hazardous fields.

WARNING

User may be exposed to potentially hazardous electromagnetic radiation levels. Review and adhere to all safety procedures before entering a suspected radiation field.

A successful power-density evaluation program should include:

- (1) Evaluation of radiating sources from the standpoint of personnel hazard potential; this will include calculation of expected rf density levels
- (2) Planning and conducting a comprehensive survey of potential hazard areas
- (3) Correlation of calculated values with measured data to insure minimum error.

Pre-evaluation of potentially hazardous areas is important. The direction and distance of sources, frequency and strength of the sources, and prominent features of the physical environment are significant to the structure of a radiation field. Differences in power density readings may result from multipath interference, standing waves, or multiple sources with different characteristics. This leads to complex radiation fields with "hot spots" at different locations for different frequencies. Moreover, some fields may fluctuate if the sources are moving antenna beams.

When measuring radiation leakage from poorly designed electronic equipment, the user will deal with the same field complexities, but with the additional problem of locating the radiation source (e.g. a crack in the shielding cabinet or poorly grounded connecting cables). Thus the technique will differ for radar or communication antennas as compared to a trial and error survey for detection of leakage or direct radiation from low power equipment.

Calculation of expected power density levels prior to entering the radiation field is desirable. The method of calculation is beyond the scope of this instruction manual. However, to obtain the average radiated power from the antenna and the resultant power density at any point in space requires consideration of the following parameters:

- Rated peak power (PP)
- Pulsewidths (PW)
- Pulse repetition frequency (PRF)
- Operating frequency (f)
- Antenna:
 - type and gain
 - orientation limits
 - beam width
 - height above ground

If the maximum value of average power density in the near field is less than the radiation protection guide limit (10 mW/cm^2) measurement is only required to locate reflections that might increase the power density.

Safety Precautions

The following precautions are mandatory (ANSI C95.3-1973) where calculations indicate the possibility that safe levels may be exceeded:

(1) The transmitting antenna is never pointed directly at monitoring personnel for the initial power measurement at any point. Orientation of the antenna and other procedures related to the survey are performed at the direction of the monitoring personnel.

(2) System operators should observe instructions issued by the monitoring personnel. The transmitting antenna should be moved slowly to prevent accidental exposure to high levels of radiation.

(3) When there is a probability that exposure of monitoring personnel will exceed the recommended levels, remote detecting devices should be used or the average power output reduced and the readings raised proportionately.

(4) Protective clothing or shielded vans should be used by monitoring personnel when exposure to high radiation levels is possible.

(5) To prevent inadvertent exposures to radiation, occupancy of an area must be controlled while measurements are made.

Operating Controls

Off-On

Provides operating voltage to all circuits. When not in use, set switch to Off to conserve battery life.

mW/cm²
2, 20, 200

Sets meter sensitivity

Zero

Electrically sets the meter indicator to zero

Pushbutton
(unmarked)

With RAHAM operational, depressing push-button connects battery to meter for battery condition indication.

A recorder jack on the power density meter is provided to enable a permanent record of power density versus time to be made, or to permit remote monitoring of radiation level.

NOTE

For convenient reference, simplified operating instructions are provided on a plate located on the bottom of the power density meter.

Operating Procedure

To prepare the RAHAM for operation, connect the probe to the power density meter, being sure to properly align the polarizing keys, and finger-tighten the probe coupling nut to a snug fit. When the extension cable is used, install it between the probe and the power density meter following the same procedure.

With the RAHAM assembled for operation and with the probe completely free from any significant radiation field:

(1) Set Off-On switch to ON

(2) Momentarily depress pushbutton adjacent to the probe connector while observing meter for indication of battery condition. If REPL is indicated, refer to BATTERY REPLACEMENT instructions. See the following step.

(3) Set mW/cm^2 switch to 2 (max sensitivity) and zero meter. Once meter is zeroed, it need not again be adjusted when changing range. *If meter fails to zero:*

... Check batteries. See BATTERY REPLACEMENT instructions.

... Failure to zero when both batteries are fresh usually indicates a burned out or defective probe.*

The instrument should be periodically checked during use to insure that the probe and circuitry remains operational. This may be quickly done by rezeroing the meter.

The RAHAM is now ready for use.

WARNING

Always approach an unknown field cautiously, starting as far away as possible and extending the RAHAM probe at arm's length toward the energy source. Allow two or three seconds for the instrument to respond. Observe all safety precautions. Do not walk into a suspected radiation field until the power density is determined to be safe.

(1) Visually inspect area to identify potential or reported radiation hazard sources (e.g. waveguide joints, cable bends, connectors or cabinet doors).

(2) Select meter range, based on pre-evaluation of source or on-site reports. If the approximate field strength is unknown, always start with the lowest range setting (2).

*The meter needle will alternately peg downscale and upscale with very slight adjustment of the zero control.

(3) Expose probe to field; allow at least 1.5 seconds for measurement of any point in space.

NOTE

For maximum accuracy, rotate the probe about its axis and average the minimum and maximum readings for each measurement.

(4) Move through area. At arbitrary survey points, slowly move probe in broad sweep to check for “hot spots”, multiple sources or both. If practical, record levels and location of each survey point.

THEORY OF OPERATION

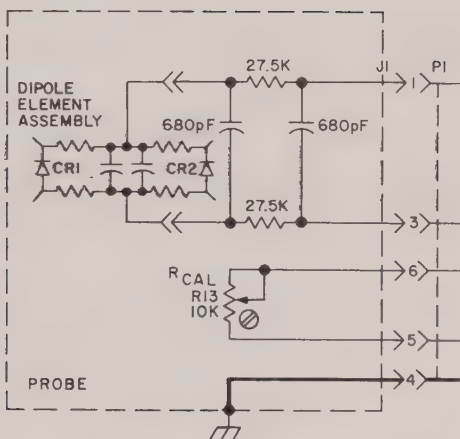


Figure 1. Schematic, Crossed Dipole Probe
Model 2 RAHAM

The following discussion will be of aid in troubleshooting:

The RAHAM Model 2 is a portable, battery-operated instrument which detects and measures potentially hazardous electromagnetic radiation emanating from rf and microwave energy sources. It is capable of direct-reading measurements from 0.2 mW/cm^2 to 200 mW/cm^2 over the frequency range from 0.01 to 3.0 GHz.

The Model 82 probe design, shown in figure 1, employs two short crossed dipoles each feeding a Schottky barrier diode (CR1 and CR2). The diode impedance is largely characterized by its barrier capacity in the frequency range of operation. This capacitance is in series with that of the short dipole whose coupling action to free space is also represented by an equivalent capacitance. For as long as the total circuit reactance is large relative to free space impedance, a condition which sets the upper frequency limit, the induced voltage for constant power density remains essentially constant with frequency. As a consequence of the capacitive divider action, the induced voltage across the diode is also constant. The lower frequency limit is reached when the barrier capacitive reactance becomes comparable to the barrier resistance. For the Model 82, that condition is reached below 0.01 GHz. The probe output is applied to the Model 481B Power Density Meter, a battery-powered, high-gain, low-noise, solid-state amplifier in an instrument case with a self-contained meter calibrated to read power density directly in milliwatts per square centimeter.

To permit field interchangeability of probe and power density meters, a potentiometer in each probe is factory calibrated to compensate for individual variation.

Probe output is applied to a highly sensitive solid state dc amplifier in the power density meter. Refer to the schematic diagram, Figure 2. The dc voltage from the probe is applied to differential amplifier U1. This amplifier must be capable of sensing the very small variations in probe output. Front panel potentiometer R5 provides the fine zero control. Course zero control and differential balance is supplied by potentiometers R7 and R8, respectively. Range settings are provided by R13, R14 and R15 and the position of Switch S1. These latter resistors form part of the amplifier feedback loop and vary the gain to suit the magnitude of probe input voltage.

Capacitors C1 and C2 provide a delay in response to field variations detected by the probe. The circuit is designed to respond from 10% to 90% of some maximum value in 1.5 seconds.

Output of the amplifier is fed to the meter from the normally closed contacts of S2. In the battery check position, R18 provides the correct current to the meter for an indication of battery condition. An external metering device may be connected across R17 through the miniature jack.

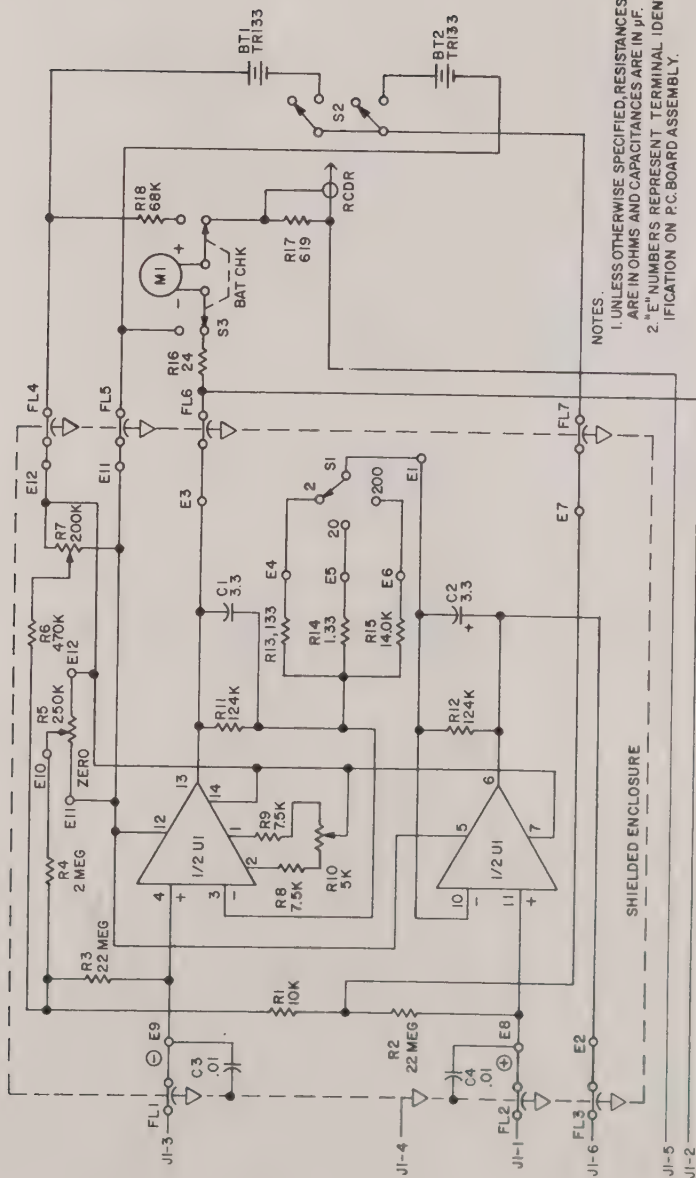


Figure 2. Schematic, RAHAM Power Meter

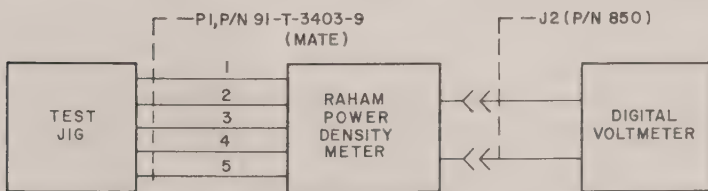
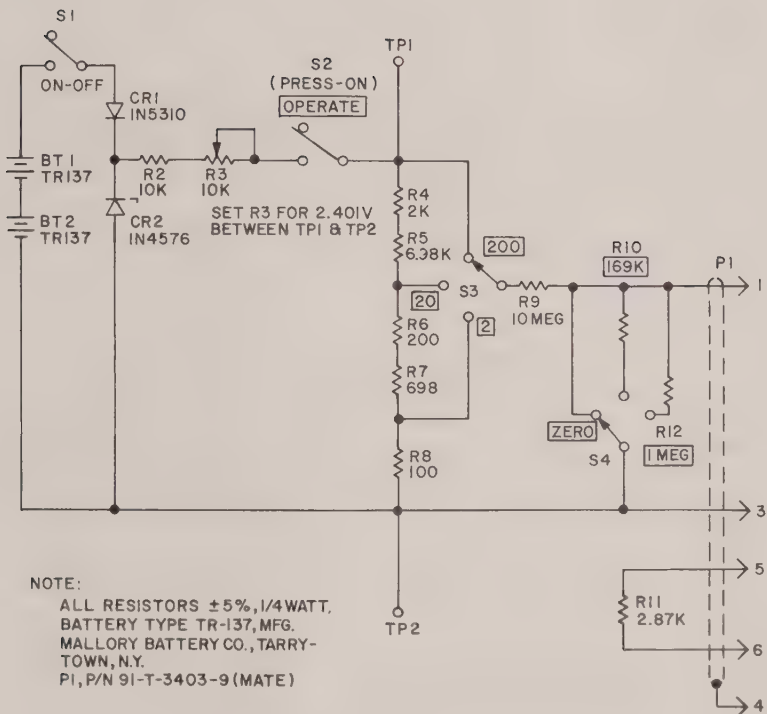


Figure 4. Test Jig Schematic and Calibration Setup

MAINTENANCE

The instrument should be cared for as any meter designed for field use. Connectors should be clean and free from mechanical abrasion or shock. RAHAM probes and meters are interchangeable. Spare assemblies may be stocked. When it is suspected that an instrument is defective, interchange of the probe or meter can be used for verification. The battery check feature may be operated without connection to a probe, however, the meter is otherwise inoperative without the probe.

Battery Replacement:

Estimated battery life is 500 operating hours. Battery shelf life can extend to two years if the unit is stored in a relatively cool environment. When replacement is required, it is necessary to replace *both* batteries. Batteries which have been subject to different discharge and shelf cycles may give erratic results, hence, they must be changed as pairs. Replace with the following battery type: Part No. TR-133, Mfg by Mallory Battery Co., Tarrytown, N.Y.

When a check of battery condition indicates replacement, proceed as follows:

- (1) Loosen the four screws which secure the housing base to the housing, and remove the base.
- (2) Loosen battery clamp captive screw.
- (3) Replace the batteries, being certain to observe the polarity indications which appear in the unit.

CAUTION

DAMAGE CAN RESULT FROM INSERTING ONE
OR BOTH BATTERIES BACKWARDS.

- (4) Tighten battery clamp captive screw.
- (5) Replace the housing base and secure.

Troubleshooting:

If the unit fails to operate properly, after batteries have been checked, isolate the trouble between probe and power meter as follows:

Remove the probe from the power density meter and verify that the resistances shown below are obtained at the probe connector. (When

viewing the probe connector, the pins are numbered counterclockwise with pin 1 to the left of the polarizing key, pin 5 to the right of the key, and pin 6 in the center.)

Connect Ohmmeter Between Pins	Acceptable Resistance Values
1 and 3*	70K to 75K ohms (Forward) 140K to 160K ohms (Reverse)
4 and case	Short circuit
5 and 6	From 100 to 10K ohms

If the resistance values obtained are not as indicated, return the probe to the factory for repair. Field repair or adjustment of a probe should not be attempted. Return defective probe assemblies to the factory. Since probes and power density meters are two-way interchangeable in the field, spare assemblies can be stocked to minimize equipment downtime.

When trouble has been isolated to the power meter, routine troubleshooting procedures should disclose the malfunction. As an initial step, it is suggested that the power density meter accuracy check described for meter calibration be performed to help isolate the cause.

Repair

Repair of a defective power density meter can be performed in the field. To gain access to the unit, remove the back of the unit as described under Battery Replacement. In addition to the special maintenance precautions described in this manual, observe the usual precautions and good practices associated with replacing components in precision electronic equipment, such as:

(1) Before using any tool, electrostatically neutralize it by touching it to a large metallic mass or a known ground.

(2) Make resistance checks using the higher ohmmeter ranges only.

(3) To avoid damage to the printed circuit board, use a temperature-controlled 1/8 inch soldering iron set to 700°F whenever

*Simpson Model 260 (or equivalent) on RX10,000 scale.

possible if component replacement is required. The heat of the soldering iron will permit the component to be removed through the conformal coating. After component replacement has been made, thoroughly remove all flux remains using a clean stiff brush dipped in Freon TMCTM solvent. Then permit a one-minute drying period and apply Humiseal 1B31TM coating using a second clean stiff brush. Allow a one hour curing period before calibrating the unit.

Replacement of Probe Protective Foam

If the probe is operative as determined by the previous resistance measurements, but if the protective foam has been damaged, it can be replaced in the field by carefully performing the following steps. Refer to Figure 3.

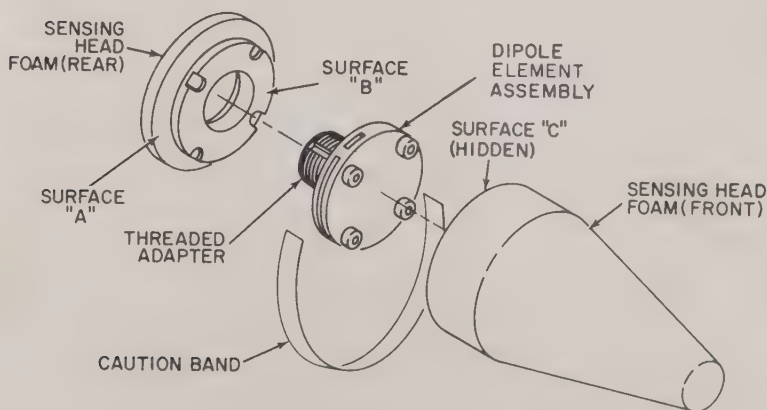


Figure 3. Replacing Protective Foam

- (1) Locate captive nut on wand directly below foam and unscrew (ccw) to remove protective foam from wand.
- (2) Remove and discard caution band.
- (3) Using a sharp blade, cut approximately 1/4-inch deep along seam at junction of surfaces A and C. Separate the sensing head front and rear. Discard the sensing head front.

(4) Carefully break cement bond between the threaded adapter and surface B. Remove adapter and discard sensing head rear.

(5) Prepare replacement sensing head front and rear by applying casein cement (e.g. Elmer's Glue-All) to surfaces A, B, and C.

(6) Lightly position threaded adapter through sensing head rear and rotate until the four plastic screws seat into the recesses in surface B. Press firmly.

(7) Lightly position sensing head front so that surfaces A and C are in contact, and rotate surfaces until the four plastic nuts seat into the surface C recesses. Press firmly.

NOTE

Seams should be completely closed. If not, plastic hardware is not properly seated into recesses.

(8) Allow four hours at room temperature for cement to cure.

(9) Apply new caution band.

(10) Position sensing head on wand and secure with captive nut.

(11) Check basic functions as described under OPERATION.

CALIBRATION PROCEDURES

Power Density Meter Calibration:

It is recommended that power density meter accuracy be checked at twelve month intervals or after a component is replaced. A test jig is shown in Figure 4. The test jig simulates the probe by providing voltages at specified impedances. The test jig provides a resistance of 2870 ohms $\pm 5\%$ between pins 5 and 6 and the following voltages from a source impedance of 166.2K ohms $\pm 0.5\%$.

Voltage	Power Range
39.90 mV	200 mW/cm ²
3.990 mV	20 mW/cm ²
0.399 mV	2 mW/cm ²

In lieu of the test jig shown, any method of simulating the proceeding is acceptable. Before calibration, insure that batteries in both the instrument and test jig are fully charged and properly installed.

Proceed as follows:

(1) Remove the four screws which secure the housing base to the housing and remove the base. With the probe removed, connect the test jig to the RAHAM as shown in Figure 4.

(2) Connect the digital voltmeter to the recorder jack of the RAHAM. Do not energize the test jig or unit under test.

(3) Check the mechanical zero on the meter of the RAHAM. Rezero if necessary.

(4) Turn on the RAHAM. Allow 10 minutes warmup.

Internal Zero Set:

(1) Rotate the RAHAM zero adjustment to the mid-position. Set the range to 2.

(2) Set the test jig to the ZERO position (input short circuited). Adjust R10 in the RAHAM for 0.000 ± 1 mV on the dvm.

(3) Set the test jig to the 1 meg position. Adjust R7 in the RAHAM for 0.000 ± 3 mV.

NOTE

After the preceding adjustments the meter should thereafter be reset to zero only by the RAHAM front panel ZERO adjustment.

Accuracy:

(1) Set the RAHAM to the 200 range. Set the test jig to the 169K and 200 position. Depress the test jig OPERATE button. This places 39.990 mV on the input to the RAHAM. The RAHAM meter should read full scale and the dvm should indicate 121-127 mV.

(2) Set the RAHAM to the 20 range. Set the test jig to the 169K and 20 position. Depress the OPERATE button. This places 3.990 mV on the input to the RAHAM. The RAHAM should read full scale and the dvm should indicate 121-127 mV.

(3) Set the RAHAM to the 2 range. Set the test jig to the 169K and 2 position. Depress the OPERATE button. This places .399 mV on the input to the RAHAM. The dvm should read 121-127 mV.

Probe Calibration:

The recommended calibration interval for the probe is six months. Since highly-specialized test equipment and facilities (such as a radio frequency anechoic chamber) are required, the probe should be sent to General Microwave or another qualified calibration facility for this service.

WITHOUT THESE FACILITIES, NO ATTEMPT TO ADJUST THE CALIBRATION POTENTIOMETER IN THE PROBE SHOULD BE MADE BY THE USER.

Government facilities which can be contacted for Power Density Calibration services are the National Bureau of Standards in Boulder, Colorado and the Bureau of Radiological Health, Division of Electronic Products, in Rockville, Maryland. Although inquiries can be made directly to either of these agencies to determine all details of available services, General Microwave will be pleased to provide assistance if required.

To perform rf calibration, obtain a measure of probe sensitivity in mV/mW/cm² at 2450 MHz. Then adjust the probe calibration potentiometer R13 for a resistance between pins 5 and 6 on the probe connector in accordance with the formula for Rcal. (The calibration potentiometer is located under the plug button on the probe handle.)

$$R_{cal} = [18.7S - 0.869] 10^3 \text{ ohms}$$

where S = the probe sensitivity in mV/mW/cm².

REPLACEMENT PARTS

Readily available components are used in the manufacture of GMC instruments whenever possible. Such parts can usually be obtained from a local dealer. Special or modified parts, are noted by an entry in the last column of table 2. These are available from GMC. When ordering parts, please indicate your instrument model and serial number, plus the data given in table 2.

With the exception of the batteries, switches, filters, connector and meter, all power density meter components are located on a single printed circuit board. The reference designations given in table 2 appear adjacent to the components on the printed circuit board.

Table 2

REF DES	DESCRIPTION	QTY USED	MFRS CODE	GMC P/N
BT1, BT2	BATTERY: P/N TR-133	2	90303	
C1, C2	CAP, FXD, EDPXY DIPPED TANTALUM, 3.3 uF, 25V; P/N D1T3R3C25	2	16546	
C3, C4	CAPACITOR, CERAMIC, .01 uF, P/N CK05	2	56289	
FL1-FL7	FILTER, EMI/RF1	7	11332	3223-000
J2	CONN; P/N TR-2A	1	82389	
M1	METER	1	11332	6547
P1	CONN; P/N 91-T-3403-9	1	02660	
P2	CONN; (MATE FOR J2); P/N 850	1	82389	
R1	RES, FXD, COMP, 10K $\pm 5\%$; P/N RC07GF103J	1	01121	
R2, R3	RES, FXD, COMP, 22 MEG $\pm 5\%$; P/N RC07GF226J	2	01121	
R4	RES, FXD, COMP, 2 MEG $\pm 5\%$; P/N RC07GF205J	1	01121	
R5	RES, VAR, CERMET, 250K	1	80294	
R6	RES, FXD, COMP, 470K $\pm 5\%$, P/N RC07GF474J	1	01121	

Table 2 (con't.)

REF DES	DESCRIPTION	QTY USED	MFRS CODE	GMC P/N
R7	RES, VAR, CERMET, 200K P/N 64Y204	1	80294	
R8, R9	RES, FXD, FILM, 7.5K $\pm 1\%$; P/N RN55D7501F	2	91637	
R10	RES, VAR, FILM, 5K; P/N 64Y502	1	80294	
R11, R12	RES, FXD, FILM, 124K $\pm 1\%$; P/N RN55D1243F	2	91637	
R13	RES, FXD, FILM, 133 OHMS $\pm 1\%$; P/N RN55D1330F	1	91637	
R14	RES, FXD, FILM, 1.33K $\pm 1\%$; P/N RN55D1331F	1	91637	
R15	RES, FXD, FILM, 14.0K $\pm 1\%$; P/N RN55D1402F	1	91637	
R16	RES, FXD, COMP, 24 OHMS $\pm 5\%$; P/N RC07GF240J	1	01121	
R17	RES, FXD, FILM, 619 OHMS $\pm 1\%$; P/N RN55D6190F	1	91637	
R18	RES, FXD, COMP, 51K $\pm 5\%$; P/N RC07GF513J	1	01121	
S1	SWITCH	1	95146	
S2	SWITCH, PUSHBUTTON; P/N MSP0205R	1	95146	
S3	SWITCH, SLIDE; P/N 23-021-118	1	10389	
U1	IC, DUAL AMPLIFIER; P/N 0P-10EY	1	06665	
—	FOAM TIP, W/O THREADED ADAPTER CONSISTING OF:			
	REAR	1	11332	7171-3
	FRONT	1	11332	7172-3
	CAUTION	1	11332	7920-3

MANUFACTURERS' CODES

CODE	MANUFACTURER	ADDRESS
01121	Allen Bradley Co.	Milwaukee, Wisc.
01295	Texas Instruments, Inc.	Dallas, Texas
02660	Amphenol Connector Div.	Broadview, Ill.
06665	Precision Monolithics	Santa Clara, Ca.
10389	Chicago Switch, Inc.	Chicago, Ill.
11332	General Microwave Corp.	Farmingdale, N.Y.
16546	U.S. Capacitor Corp.	Burbank, Ca.
56289	Sprague Electric Co.	N. Adams, Mass.
80294	Bourns, Inc.	Riverside, Ca.
82389	Switchcraft, Inc.	Chicago, Ill.
90303	Mallory Battery Co.	Tarrytown, N.Y.
91637	Dale Electronics, Inc.	Columbus, Nebr.
95146	Alco Electronics Products Inc.	Lawrence, Mass.

WARRANTY

General Microwave Corporation warrants all parts of equipment of its manufacture to be free from defects caused by faulty material or poor workmanship. This warranty excludes electronic tubes, batteries, natural rubber and material normally consumed in operation unless such excepted items fail as a result of improper application by General Microwave.

Liability under this warranty is limited to the obligation to repair, or, at General Microwave's sole option, to replace without charge, FOB general Microwave's Plant, any part found to be defective under normal use and service within the time periods shown below, provided:

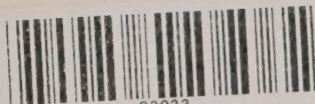
- (1) General Microwave Corporation is promptly notified within the warranty period in writing upon discovery of such defects;
- (2) The original parts or equipment are returned to General Microwave Corporation, transportation charges prepaid;
- (3) General Microwave Corporation's examination shall disclose to its satisfaction that such defects have not been caused by abuse after delivery; and
- (4) Warranties shall not apply to items which have been repaired or altered by others than General Microwave Corporation or its authorized agency.

The period of warranty is one year after delivery of the instrument to the original purchaser.

The warranty period shall not include any period of time the unit or part fails to perform satisfactorily due to such defect, and any unit, part or component repaired or replaced by General Microwave pursuant to this warranty shall itself be guaranteed as specified above.

6135-00-990-1822

Battery, Dry Px21



93033

GENERAL MICROWAVE CORPORATION

155 Marine Street, Farmingdale, N.Y. 11735 TWX 510-224-6406
Telephone: 516-694-3600

Litho in U.S.A.